Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC

In the Matter of	)	
	)	
An Inquiry into the Commission's	)	
Policies and Rules Regarding AM	)	MM Docket No. 93-177
Radio Service Directional Antenna	)	RM-7594
Performance Verification	)	

COMMENTS OF THE WALT DISNEY COMPANY

I. Introduction

The Walt Disney Company, on behalf of itself and its subsidiary, ABC, Inc. ("ABC"), hereby submits Comments in response to the Notice of Proposed Rulemaking in the above-captioned proceeding ("*Notice*").[1]

In its *Notice*, the Commission recognizes that proper adjustment of AM directional antennas is necessary to control interference and to assure adequate community coverage. The Commission seeks comment on a number of specific proposals to lessen the cost and time required to verify the proper adjustment of AM directional antenna arrays. In the comments below, ABC addresses specific aspects of several of the Commission's proposals.

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[1] *An Inquiry into the Commission's Policies and Rules Regarding AM Radio Service Directional Antenna Performance Verification*, Notice of Proposed Rulemaking, WT Docket No. 93-177 (FCC 99-126, rel. June 11, 1999).

II. Discussion

ABC recognizes that arrays subjected to complete computer analysis may need far less verification, and believes that how to treat such analyses should wait for agreement among the engineering fraternity. Many stations may either prove not amenable to conducting computer analyses or, for other reasons, the arrays of many stations will continue to be adjusted and proven without such analyses. Cases in which computer analysis is not performed will continue to require full proofs which can stand on their own, and it is to these cases that the discussion below is directed.

Measurements

An AM directional antenna is comprised of several towers, built in a precise relationship to each other, and occupying a significant area of land. The problem in field measuring an AM directional array is that the inverse field cannot be measured directly because the size of the array prohibits it from being considered as a point source. This is recognized by the Commission at subparagraph 15(1) of the *Notice*. For example: ten times the maximum array spacing for a simple 3-tower in-line mid-band array spaced a common 90 degrees is 1.5 km. Arrays with more towers, wider spacing, and/or operating at lower frequencies are larger, often much larger, so the closest valid directional measurement point of such arrays is even farther.

By contrast, 5 times the height of one of the towers operating as a reference nondirectional antenna is far less. Using the same example of a mid-band array with common 90 degree towers, the closest valid measurement point is under 0.4 km away. But only points within 3 km of the AM antenna reflect the inverse field relatively

unattenuated by soil conductivity, as the Commission recognizes in paragraph 15 of the Notice. The result is that virtually all of the points which provide the only direct indication of inverse field, especially the most critical points closest to the antenna, can be measured only for the reference nondirectional antenna, and not at all for the directional antenna system.

When proofing a station, the close-in measurements are used solely to confirm the inverse field radiation of the nondirectional radiator, so the conductivity of the soil along the radial from the antenna may be determined by continuing to measure points nondirectionally at the greater distances. With the soil conductivity known, the points beyond 3 km (or ten times the maximum array spacing) are revisited with the directional antenna operating. The inverse field of the directional antenna along each radial azimuth is determined from the relationship of the directional readings to the distant nondirectional readings at the same points. Of some 30 total points on a radial, roughly half (the close-ins) are invalid and not measured directionally, so the total number of measurements needed to ensure validity is actually about 45.

At subparagraph 15(2) of the Notice the Commission proposes that close-in measurements continue to be made at 0.2 km intervals, which would require nearly 15 close-in measurements from the nondirectional tower. In our experience, this would be appropriate to confirm the radiation of the tower. But these measurements cannot be used to analyze the directional antenna adjustment because they cannot be measured directionally.

On the other hand, insufficient close-in measurements easily can result in erroneous analysis concluding that the nondirectional radiation is well below theoretical.

Such conclusions result in the directional radiation erroneously appearing to be down as well on that radial. ABC has seen such false conclusions entirely too many times on null radials.

The ABC proposal for reducing to 15 the total number of measurement points needed on a radial relies upon nondirectional antenna theory. The proposal also relies upon ABC's observations that sufficient close-in measurements made on the reference nondirectional tower of a directional array, with antenna power correctly measured, virtually always show the tower to be performing in accordance with theory, provided that the other towers in the array have been properly isolated unless there is something wrong or unusual (non-sinusoidal) about the tower itself. ABC's proposal specifically was to avoid reading the close-in points by assuming that the nondirectional radiator was operating properly and analyzing the nondirectional far-out points with the nondirectional inverse field set to theoretical. Only the far-out points need to be read at all, so the 15 far-out points read both directionally and nondirectionally would comprise a complete full proof radial. This would significantly reduce the labor required to make a full directional proof while maintaining the validity of the measurements and conclusions.

In subparagraphs 15(3) and (4) of the Notice, the Commission proposes that additional measurements be made at 8 points between 3 and 15 km; and at paragraph 16 the Commission proposes that no measurements be required at points beyond 15 km. We concur with ending the radial measurements at 15 km unless otherwise there are too few available points. Points more distant are too affected by soil conductivity

and too much time is expended driving long distances between points to make such measurements worthwhile.

ABC believes, however, that 8 points per radial to be read directionally for a full proof is too few to accurately establish the directional/nondirectional relationship, especially where urbanization causes significant "scatter" in the readings. Fifteen points are needed between 3 and 15 km (or between 10 times the maximum array spacing and 15 km) to provide a reliable indication of the actual directional signal level. ABC also is concerned that reducing the number of points might result in selective reporting of points along the radial. The measurement of 15 points will tend to limit the leeway for pattern adjustment by reporting selective data, particularly in urban areas, and most particularly in deep nulls (where scatter is often extremely bad).

Critical Arrays

ABC concurs that the requirement for precision monitors has outlived its usefulness. Today's monitors are advanced and precise enough to be used for any array. But the actual problem of critical arrays remains.

The patterns produced by some antenna systems shift greatly with very small changes in parameters. Operating an array for long periods with parameters misadjusted within standard tolerances, but with the resulting radiation pattern exceeding the standard pattern envelope such that interference is caused, may damage another station's service area for years.

AM stations with very large service areas have to be protected by other stations over very wide arcs, and the depths of the pattern nulls necessary to protect service at night due to long distance skywave effects are very significant. FM directional antennas

are not permitted to have maximum to minimum ratios of over 15 dB. TV station directional antennas are limited to front/back ratios not over 10 dB for channels 2-13 and not over 15 dB for channels 14-69. But there is no limit on the beam/null ratio for AM directional antennas, so adjustment is much more critical and misadjustment can cause much more damage. Many night time directional antennas have maximum/minimum ratios in the 30 dB range, some over 40 dB, and ABC has found one as high as 57dB. Such antenna systems must be adjusted correctly and maintained in precise adjustment. Most of these antennas were authorized before the problem of parameter shift was recognized, but some were not.

Once the antenna system has been adjusted to within the standard pattern envelope, the electrical parameters of the signals feeding the physical tower structures are subject to variation over time, and the resulting pattern shifts as a result. Current rules allow for 5% and 3 degree tolerance. However, virtually all patterns ABC has studied will exceed the standard pattern envelope even with one set of parameters well within the 5% and 3 degree tolerance. The standard pattern envelope was designed with too little leeway for this much operating tolerance.

If interference is caused by a station operating within the 5%, 3 degree limits, there are three possible solutions: 1) restrict the operating tolerances more tightly, 2) cause interference, or, 3) evaluate the antenna system on a per element basis, then restrict those elements that are most likely to cause interference. For example, on a six tower array, towers 2 and 3 may need to be maintained within critical limits, but 1,4,5 and 6 could maintain standard limits. Or, if the combination of ratio 2 high and phase 4 low triggers interference, only that combination need be restricted. This last option may

be preferable in future allocations as an alternative to placing an entire array into a critical designation.

While many antenna systems which should be designated critical arrays have not been, this should not be cause for ignoring the problem. The stated goal of the Commission in its Docket MM 87-267 was to reduce interference on the AM band. The critical nature of antenna systems cannot be ignored and still attain this objective. ABC concurs with the proposal at paragraph 41 of the Notice to routinely check at least some new antenna systems during the application process and restrict parameter tolerances as necessary.

We have found the most sensitive areas of a pattern to exceeding standard pattern radiation limits by parameter variation are not in a null (par. 43 of the Notice) - where the maximum effect of Q is felt - but just coming out of the null, where the signal strength rises rapidly versus azimuth. This is most felt in protection to wide arcs of skywave service, where the closest approach to the service contour (and hence the area most likely subject to interference) is not in the protecting station's null but some distance from it. We concur that instability which does not cause interference is not important, but the only way to know if interference will be caused is to analyze the vertical pattern.

Finally, ABC agrees that the critical array problem is limited during daytime because of the lack of skywave.

Number of Radials Required for Full Proof of Performance

Each null and minor lobe needs one radial, unless the array is symmetrical, in which case symmetry may be applied. One radial down the main lobe(s) is useful to show

compliance with minimum RMS. A two-tower "cardioid" array with stacked nulls could be defined by two radials, and other two-tower arrays by as few as 3 radials, except for reradiation, and assuming the physical layout of the towers is correct. Adding one radial in one relatively low-signal direction would account for reradiation. We do not support either unnecessary radials or artificially limiting the number of radials needed to characterize extremely complex arrays with many nulls.

Number of Points Required for Partial Proof of Performance

Where there is significant "scatter", usually in urban areas, many stations now read many extra points during a proof simply to provide for a good selection of data points to discard. Reducing the number of points to be reported for a partial proof allows more adjustment by data selection.

When to Require Partial Proof of Performance

ABC agrees that it may be possible to avoid the necessity for partial proof of performance upon replacement of system components, as well as other components on the towers, provided that the replacement components are characterized adequately to be certain they are exact replacements and meet other stated conditions. Examples are size and orientation of sample loops, as well as orientation, or length and phase delay of the sample line.

Monitoring Points

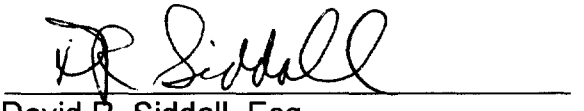
So long as a replacement monitor point is selected from points previously measured for a full proof of performance, ABC concurs with the proposal. If a completely new point is selected, running the radial is sufficient, rather than running a complete partial proof of performance.

ABC believes that currently it is difficult for another station or FCC inspector to determine the exact location of a monitor point because the FCC no longer prints directions to monitor points on new licenses. Distance and azimuth from array center is not sufficient information, in practice, to find a monitor point precisely enough. Points should be defined to within roughly a 50 foot radius (less in some urban areas), or the variance in value is too great to be meaningful. A reference address or coordinates, and a "spot" detail would facilitate locating the place with sufficient precision.

III. Conclusion

The Commission's proposals are intended to relieve owners of directional AM antennas of unnecessary burdens without jeopardizing the technical integrity of the AM broadcast service. Consideration of the above comments will assist in ensuring that directional arrays provide the intended protection to other stations and service in the desired direction.

Respectfully submitted,



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